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Oncaglossum, a New Genus of the Boraginaceae, Tribe Cynoglosseae, from Mexico

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ABSTRACT. A new monotypic genus, *Oncaglossum* Sutorý, endemic to central Mexico, is described based on *Cynoglossum pringlei* Greenm. from the state of Mexico and belongs within the tribe Cynoglosseae of the Boraginaceae. The new genus is related to *Cynoglossum* L. subg. *Eleutherostylum* (Brand) Riedl and can be distinguished from the North American species currently classified in *Cynoglossum* by its calyx with imbricate, colored, and broadly ovate sepals, the corolla lobes reduced to narrow strips, anthers on short filaments inserted on the corolla margin, the stigma in the form of a lenticular disc, and tricolporate pollen grains with an additional aperture in their polar region.

Key words: Boraginaceae, Cynoglosseae, *Cynoglossum* subg. *Eleutherostylum*, Mexico.

The generic concept in *Cynoglossum* L. (Boraginaceae, Cynoglosseae) has been discussed for a long time, and various concepts have been used. The moderately conservative concept by Brand (1921) was followed by Riedl (1962) and Al-Shehbaz (1991). Dinter (2009: 336) also favored this view by preferring to keep the two genera *Cynoglossum* and *Paracaryum* Boiss. separate “for the time being.” A broader concept by Johnston (1924b) included the genera *Solenanthus* Ledeb., *Lindelofia* Lehm., *Kuschakewiczia* Regel & Smirn., and *Trachelanthus* Kunze. In the extremely broad concept by Greuter (1981), *Cynoglossum* (as three subgenera) included not only *Solenanthus*, but also *Rindera* Pallas (= *Mattia* Schult.) and *Paracaryum* (including *Mattiastrum* (Boiss.) Brand). Valdés (2004) used a similar broad concept that included the additional genera *Suchtelenia* Kar. ex Meisn. and *Trachelanthus*. A narrower approach was initiated by Popov (1953), who distinguished the new genus *Paracynoglossum* Popov, which was later justified by Mill and Miller (1984), and suggested detaching also the North American and Australian species, which was realized in part by Mill (1989) with his segregation of *Cynoglossum latifolium* R. Br. as the genus *Austrocynoglossum* Popov ex R. R. Mill). Barbier and Mathez (1973) separated a group of mainly northwestern African species in the genus

Pardoglossum Barbier & Mathez, which Greuter (1981) later recognized as *Cynoglossum* subg. *Mattia* (Coss.) Greuter. Apparently the phylogenetic analysis of DNA sequences is needed to provide a more satisfactory resolution.

Hilger’s (1985) studies of fruit micromorphology of Boragineae and the recently published concept by Hilger et al. (2005), using arguments based on the latest molecular studies in the family Boraginaceae, corroborate this tendency toward smaller genera. A consequence of the work of Mohr et al. (2008) must be nomenclatural changes for the North American *Cynoglossum* species. The suggested separation of the most differentiated species, *C. pringlei* Greenm., as the new genus *Oncaglossum* Sutorý is described here and will be followed by nomenclatural changes for other North American *Cynoglossum* species.

The description of the new genus *Oncaglossum*, based on the Mexican species *Cynoglossum pringlei*, is supported not only by its unique and conspicuous morphological characters, but also by its relatively isolated geographical position and occurrence in an area already conspicuous for its endemism, within four neighboring states of central Mexico (México D.F., Michoacán, Jalisco, and Guanajuato). This distribution is restricted to the Transmexican Volcanic Belt biogeographic province (Morrone, 2005), known for its large number of endemic species (Marshall & Liebherr, 2000; Nivei, 2008).

Villaseñor (2004) and Campos Ríos and Lira Charco (2008) recently reported the following species of *Cynoglossum* from Mexico: *C. henricksonii* L. C. Higgins (Higgins, 1976b), *C. mexicanum* Schltdl. & Cham., and *C. hintoniorum* B. L. Turner. *Cynoglossum henricksonii* [= *C. erectum* L. C. Higgins, nom. illeg. (Higgins, 1976a)] belongs to the synonymy of *C. creticum* Mill., a species quite common in the Mediterranean region of Europe. The occurrence of the latter species in Mexico is—similar to its occurrence in South America (Reiche, 1907; Brand, 1921; Johnston, 1924a)—of secondary origin analogous to the Asian species *C. amabile* Stapf & J. R. Drumm. *Cynoglossum mexicanum* was previously transferred to the genus *Hackelia* Opiz of the

neighboring tribe Eritrichieae (= Cryptanthaeae) as *H. mexicana* (Schltdl. & Cham.) I. M. Johnst. *Cynoglossum hintoniorum* has to be transferred to this genus as well, and the combination is made below. The only native species that can be assigned to this genus in Mexico is the species under current study, *C. pringlei*. The nearest occurrence of species currently classified in *Cynoglossum* is situated far to the north, where *C. grande* Douglas ex Lehm., *C. virginianum* L. (including *C. boreale* Fernald), *C. occidentale* A. Gray, and *C. viride* Eastw. occur, and all are currently placed in *Cynoglossum* subg. *Eleutherostylum* (Brand) Riedl. Their distribution extends all the way up the Pacific coast from the Mexican border to Canada and, in one instance (*C. virginianum*), across to the eastern states of Canada and the United States. The generic placement of these North American species presumably in *Cynoglossum* is presently under review. According to Mohr et al. (2008), on the basis of molecular markers they belong to a separate monophyletic group next to the Eurasian/North African one. Other genera included in this clade belong to the tribe Eritrichieae (*Cryptantha* Lehm. ex Fisch. & C. A. Mey., *Plagiobothrys* Fisch. & C. A. Mey., *Amsinckia* Lehm., and *Pectocarya* DC.).

According to Villaseñor (2004), the tribe Cynoglosseae in Mexico includes, apart from the proposed genus *Oncaglossum*, three other indigenous genera: *Mimophytum* Greenm. (one species), *Omphalodes* Mill. (five species), and *Pectocarya* (seven species).

Hackelia hintoniorum (B. L. Turner) Sutorý, comb. nov. Basionym: *Cynoglossum hintoniorum* B. L. Turner, *Phytologia* 79(4): 306. 1995 [1996]. TYPE: Mexico. Oaxaca: Distr. Miahuatlán, Cerro Quiexobra, 3145 m, 19 Oct. 1995, G. B. Hinton et al. 26206 (holotype, TEX 253).

KEY TO NORTH AMERICAN GENERA OF THE TRIBE CYNOGLOSSEAE (ADAPTED AFTER JOHNSTON, 1924A)

- 1a. Dorsal surface of nutlets naked or occasionally covered with uncinat appendages, with a callous or chartaceous margin that is entire or serrate or with uncinately tipped subulate teeth or appendages.
 - 2a. Fruiting pedicels nodding or reflexed, coarse, stiff, shorter than nutlets, corolla minute, tubular or salverform, gynobase with subcordate apex, nutlets flat or convex and somewhat ovate or elongate *Pectocarya*
 - 2b. Fruiting pedicels various, usually flexuous, much longer than nutlets, corolla usually conspicuous, subrotate or rotate-tubular, gynobase conical, nutlets with cupulate margins *Omphalodes*
- 1b. Dorsal surface of nutlets rather uniformly covered with glochidiate filiform or subulate appendages,

- rarely margined and then merely by a wrinkle in the pericarp.
- 3a. Nutlets lenticular, very depressed, cicatrix on the base of the ventral part of nutlets, cauline leaves on slender petioles at least half as long as the deeply cordate blades, plants weak and trailing. *Mimophytum*
- 3b. Nutlets turgid, usually ± compressed ovoid, cicatrix in the upper part of the ventral part of nutlets, cauline leaves sessile or on very short winged petioles that are very much shorter than the linear to oblanceolate blades, plant erect.
 - 4a. Calyx not imbricated, with green, oblong sepals, corolla lobes ovate, anthers inserted in the corolla tube, stigma club-shaped or inversely conical . . . *Cynoglossum* (subg. *Eleutherostylum*)
 - 4b. Calyx with imbricate, colored, and broadly ovate sepals, corolla lobes reduced to narrow strips, anthers on short filaments inserted on the corolla margin, stigma in form of lenticular disc *Oncaglossum*

Oncaglossum Sutorý, gen. nov. TYPE: *Oncaglossum pringlei* (Greenm.) Sutorý [= *Cynoglossum pringlei* Greenm.].

Genus novum inter genera Americae borealis tribus Cynoglossearum *Cynoglossum* L. (subg. *Eleutherostylo* (Brand) Riedl) affine, sed ab eo sepalis imbricatis atropurpureis late ovatis, lobis corollinis in lacinias angustas reductis, antheris filamentis brevibus ad marginem corollae insertis insidentibus, stigmatis forma disco lenticulari atque granis pollinis tricolporatis in parte polari apertura additicia praeditis distinguitur.

Oncaglossum pringlei (Greenm.) Sutorý, comb. nov. Basionym: *Cynoglossum pringlei* Greenm., *Proc. Amer. Acad. Arts Sci.* 40: 30. 1904. TYPE: Mexico. México: Fultenango Cañon, 2500 m, 9 Oct. 1902, C. G. Pringle 11350 (holotype, GH). Figure 1A.

Additions to the features of the original description by Greenman (1904) appear in italics.

Perennial herbs to 1–1.5 m high, taproot massive, stems leafy up to the inflorescence, striate, hirsute-pubescent. Stem leaves sessile, semi-amplexicaul, oblong-lanceolate, 3–12(–16) × 1–4(–7) cm, acute, entire, dark green adaxially, paler abaxially, hirsute-pubescent on both surfaces. Inflorescence compound, many-flowered, ± bracteate; pedicels 0.5–2 cm, recurved at least in later stages, appressed pubescent; calyx 5-lobed, calyx lobes dark purple, 2.5–6 mm, broadly ovate to almost round, imbricate, glabrous outside except for closely adpressed pubescence at the very base, on inner side with short stout trichomes; corolla green to lemon yellow when young, later brown, ca. 4 mm, corolla lobes narrow, separated, ca. 2 × 0.5–

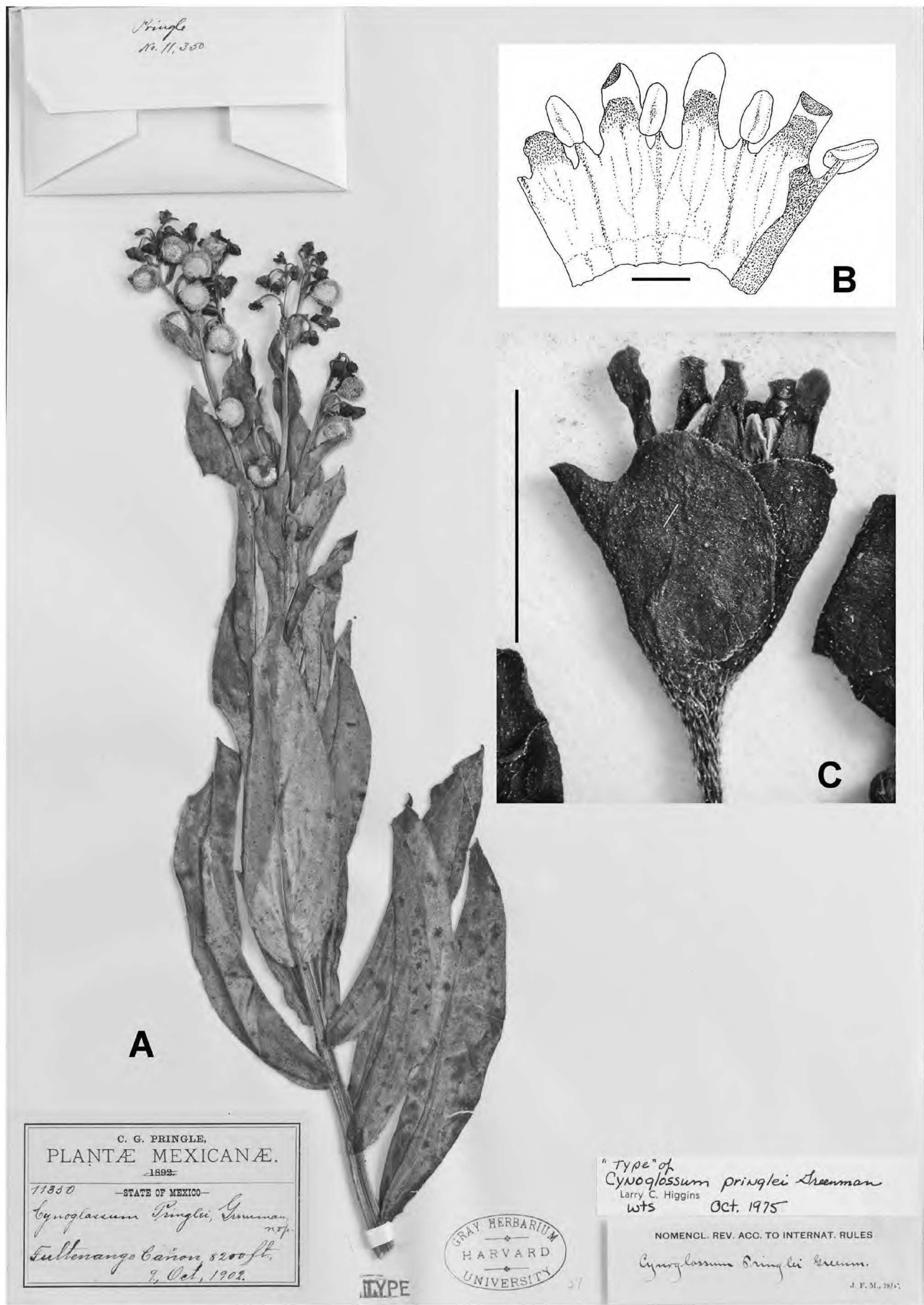


Figure 1. *Oncaglossum pringlei* (Greenm.) Sutorý. —A. Holotype (Pringle 11350, GH). —B. Dissected corolla (Leavenworth s.n., GH). —C. Flower (Leavenworth s.n., GH). Scale bars: B = 1 mm; C = 5 mm.

0.7 mm, slightly shorter than corolla tube, faucal scales trapezoid, as wide as corolla lobes and 0.5–0.6 mm long; anthers ca. 1 mm on ca. 0.3–0.4 mm filaments inserted on the margin of the corolla between the

corolla lobes, below the faucal scales; style 1.5–2 mm, persistent, round in cross section; stigma in form of lenticular disc, ca. 0.2 mm diam. with long sparse papillae. Ripe nutlets perfectly separated from style,

broadly ovate or subrotund, dorsiventrally compressed, 10–12 mm long, nearly or quite as broad as long, *without elevated margin, glochids becoming gradually smaller and infrequent toward the convex middle and toward the top*, glochidiate-hispid on the upper or outer surface, smooth beneath, *glochids 0.5–1 mm; attachment scar apical*, triangular-ovate, ca. 3×2 mm. Pollen grains oblong, 9.5–11.5 μm , tricolporate, apertures not connected in an equatorial plane.

Etymology. The new genus is named after the jaguar, *Panthera onca* L., a beast of prey worshipped by the pre-Columbian Mexican tribe, the Olmec.

Discussion. This monotypic genus is related to the North American species presently classified in *Cynoglossum* subg. *Eleutherostylum*. It differs in the calyx possessing imbricate, colored, and broadly ovate to almost round sepals (vs. green, oblong-lanceolate or oblong in subgenus *Eleutherostylum*), the corolla lobes reduced to narrow strips (vs. not reduced, rounded or oblong lobes), the anthers on short filaments inserted on the corolla margin in conspicuous gaps between the petals (vs. filaments inserted in the corolla tube), the stigma in the form of a lenticular disc (vs. club-shaped or inversely conical), and the smaller tricolporate pollen grains with colpi and colpi not connected in an equatorial plane distinctly differing in size and shape and with an additional aperture in their polar region.

Johnston (1924a: 32, 33) gives further information: “Although closely related to *Cynoglossum officinale* this species, a native of south central Mexico, is clearly distinct in its larger and differently shaped nutlets and short style. Frequently only a single nutlet is matured from each flower.” In his key to species, he erroneously groups *C. pringlei* under plants with “nutlets sunken in dorsally and having a definite elevated margin.” Nutlets in *C. pringlei* lack an elevated margin as formed in *C. officinale* and other *Cynoglossum* and *Solenanthus* species (Fig. 2C, D), but some immature fruits may form this margin secondarily when dried.

Cynoglossum pringlei was recorded for the first time by Sessé and Mociño on the expedition through the Michoacán (Moldano Polo, 2004) and later published under the illegitimate name *C. appeninum* Sessé & Moc. (Sessé & Mociño, 1891–1897). Brand (1921), monographer of the genus *Cynoglossum*, and Riedl (1962), in his later overview, did not see *C. pringlei* and placed it in their Species incertae sedis. R. R. Mill, on his identification labels in Kew dated 19 March 1983, used the never validly published combination *Eleutherostylum pringlei* (Greenm.) R. R. Mill, which better corresponds to the classification of this taxon.

The new genus is a natural evolutionary unit and differs from all other genera in the tribe Cynoglosseae by the following characters:

- The calyx has imbricate, colored, and broadly ovate to almost rounded sepals (Fig. 1C). Brand (1921) mentions for this tribe ovate and obtuse or linear-lanceolate, more or less acute sepals. They are normally green and not overlapping.
- The corolla lobes are reduced to narrow strips (Fig. 1B) and separated by conspicuous gaps with inserted stamens. In this tribe the corolla lobes are mostly broadly ovate or almost rounded (Brand, 1921). Only some species of *Rindera* have linear lobes, which is exceptional for this tribe, but that genus differs from *Oncaglossum* in many other characters (e.g., winged fruits, the shape of the style and inflorescence).
- Anthers are on short filaments, inserted on the margin of the reduced corolla. The point of insertion is actually similar to other Cynoglosseae, but the strong reduction of the corolla positions the anthers marginally. In all genera in the Cynoglosseae, the filaments are inserted inside the corolla tube at least at its top (Brand, 1921: 7).
- The stigma forms a lenticular disc, ca. 0.2 mm diam., with sparse, long papillae. In North American species of *Cynoglossum* subg. *Eleutherostylum*, the stigma is inversely conical or club-shaped with a flattened distal part, always with short papillae.
- The pollen grains are tricolporate, i.e., having three compound apertures (colpori) alternating with three simple apertures (pori). The colpi and colpori are distinctly different in shape and size in *Oncaglossum* and are not connected in an equatorial plane. They are of the same type as pollen grains of most North American species of subgenus *Eleutherostylum* (*Cynoglossum virginianum*, *C. viride*, and *C. occidentale*), but differ by having an aperture in the polar region (Fig. 2A, D) and by the dimension of the pollen grains (9.5–11.5 μm vs. 14–20 μm in the North American species of subgenus *Eleutherostylum*). Similar apertures in the polar region are known within the Boraginaceae, but only from the Eritrichieae, namely in *Cryptantha intermedia* (A. Gray) Greene (Hargrove & Simpson, 2003) and in species of *Hackelia* (Gentry & Carr, 1976). Pollen grains in *Solenanthus* are of a similar type, but differ by the almost rounded grain shape. The genus *Pardoglossum* has extremely distinctive pollen grains that are quite different from any other Cynoglosseae (Barbier & Mathez, 1973; Mathez, 1974). *Cynoglossum grande*, together with other Eurasian

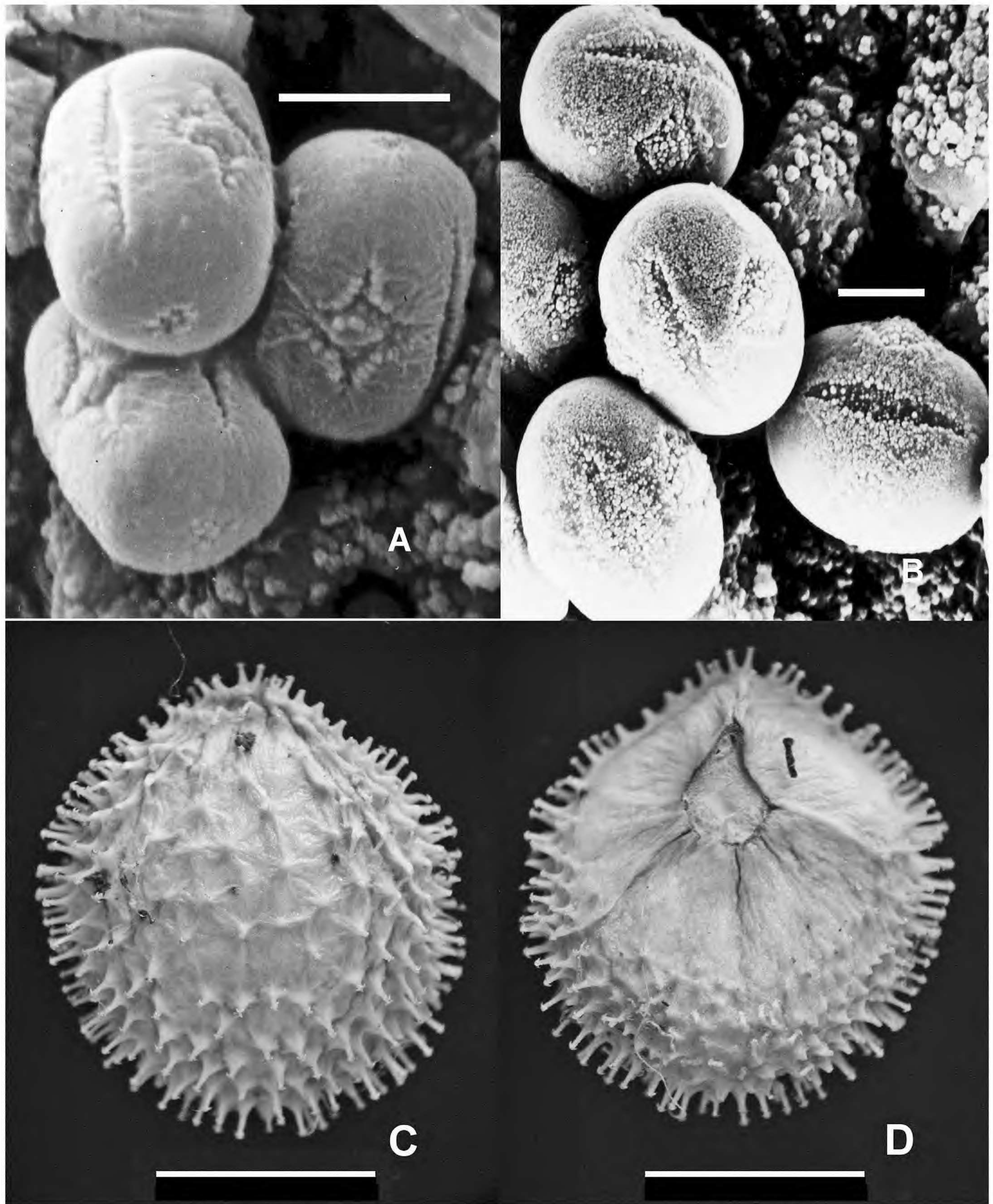


Figure 2. A, B. Pollen grains. —A. *Oncaglossum pringlei* (Leavenworth s.n., GH). —B. *Cynoglossum occidentale* (Gray s.n., MO 1300349). C, D. *Oncaglossum pringlei*, nutlets. —C. Dorsal part (Pringle 11350, GH). —D. Ventral part (Pringle 11350, GH). Scale bars: A, B = 5 μ m; C, D = 5 mm.

species of *Cynoglossum* and the related *Paracynoglossum*, has a more or less developed equatorial connection of the apertures (Barbier & Mathez, 1973; Mathez, 1974; Sahay, 1979; Liu et al., 2001).

- The large nutlets (10–12 mm long) in *Oncaglossum* are similar to those of *Cynoglossum* and *Solenanthus*, but the whole dorsal portion is unique in its shape (Fig. 2C). Glochids are of different length (0.5–1 mm) and are irregularly distributed on the

surface of the nutlet. They become gradually smaller and infrequent toward the convex middle (and toward the top) without creating a distinct margin or flat areole. The geographically closest North American species of *Cynoglossum* subg. *Eleutherostylum* differ in having nutlets that are not or only slightly dorsiventrally compressed and with glochids that are equally long and regularly densely distributed over the entire surface.

Specimens examined. MEXICO. **Guanajuato:** Cuchilla del Pajarito, ca. San Luis de los Augustinos, Mpio. Acámbaro, 2400 m, 20 July 1987, *H. Díaz-Barriga* 4048 (MEXU 559042). **Jalisco:** Sierra del Tigre, 3 mi. S of Mazamitla, 2100–2200 m, 16 Sep. 1952, *R. McVaugh* 12933 (GH); Gómez Farías, 15 km al NE de Cd. Guzmán, carr. a San Andrés Ustlán, luego 19 km al E por brecha a Concepción de Buenos Aires, 1980 m, 2 Sep. 1988, *M. Fuentes* 621 (MEXU 602461); 16–17 km al NE de Cuautitlan, Cerro El Almeal, 19°33'58"N, 104°15'25"W, 2050–2120 m, 22 July 1988, *R. Cuevas Guzman* L. 3164 (MEXU 668715); pine-oak woods, 7000 ft. near Tapalpa, 7 Aug. 1969, *Anonymous* 71004 (K [R. R. Mill annot., *Eleutherostylum pringlei* (Greenm.) R. R. Mill, 19 Mar. 1983]); Cerro de Talcozaqua [Sierra de Tapalpa], 2–3 km E of Tapalpa [ca. 19°57'N, 103°45'W], ca. 2000 m, 5–7 Aug. 1960, *H. H. Iltis*, *R. Koepen*, *F. Iltis* (MEXU 56219); Jocotepec, Ladera S del Cerro Viejo, NE de Potrerillos, 31 July 1994, *J. A. Machuca*, *M. Cházaro* 7130 (MEXU 991163). **Michoacán:** Morelia (Michoacán) et de Moro Leon (Guanajuato), 1893, *A. Duges s.n.* (GH); vic. of Morelia, Cerros San Miguel, 2100 m, 15 Sep. 1910, *G. Arsène* 5949 (BM, GH, MPU); Sierra Torricillas, 2200 m, 26 July 1939, *G. B. Hinton s.n.* (GH); Tancitaro, at Pedregal lava flow 2 mi. S of Tancitaro, 6500 ft., 14 Aug. 1940, *W. C. Leavenworth s.n.* (GH, TEX-Lundell Hb.); Distr. Coalcoman, Llano, Sierra Torricillas, 2250 m, 28 July 1941, *G. B. Hinton* 15930 (K [R. R. Mill annot., *Eleutherostylum pringlei* (Greenm.) R. R. Mill, 19 Mar. 1983, unpublished ms. name]); Mpio. Coeneo, 2 km al NE de la deviación a Bellas Fuentes, 1970 m, 5 July 1986, *H. Díaz Barriga* 2403 (MEXU 1110944); bosque de encino 3 km al N de Santiago Azajo, Mpio. Coeneo, 2080 m, 14 July 1988, *Pio X. Ramos* 141 (MEXU 807447); Santa Clara del Cobre, sobre el camino al Cerro de la Cantera, 2200 m, 11 Aug. 1988, *E. Pérez Calix* 156 (MEXU 813605).

Acknowledgments. I am very grateful to Robert R. Mill for the critical revision of the manuscript that included many useful improvements and corrections. My thanks are due to the curators of the herbaria BM, GH, K, MEXU, MPU, and TEX for providing access to their collections, and to Jiří Lhotecký for SEM imaging. The work was financially supported by a long-term research grant (MK 00009486201) from the Ministry of Culture of the Czech Republic.

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